

# NASA Integrated Partnership Program

## *John C. Stennis Space Center*



## ***LOW COST ENGINE TEST STAND FACILITATES ROCKET ENGINE TESTING***



**Small Engine Test Stand with Mounted Engine**



**Hot Fire Test**

Under a Small Business Innovative Research (SBIR) contract with NASA's John C. Stennis Space Center, AJT & Associates, Inc. of Cape Canaveral, FL, has created a low-cost engine test stand for small thrust engines. The heart of the system is the Quick Disconnect (QD) Technology, this technology is incorporated in the propellant lines used to transfer fuel and oxidizer from the test facility to the engine. Utilization of the QD technology allows testing on numerous articles without having to re-configure the test facility.

The rocket engine test facilities at Stennis Space Center (SSC) are some of the finest in the world; as such, these facilities are frequently refitted and overhauled when new test articles are introduced. Therein lies the problem; reconfiguration and modification of these facilities is expensive and time consuming. Under a Small Business Innovative Research (SBIR) contract with NASA's John C. Stennis Space Center, AJT & Associates, Inc. of Cape Canaveral, FL, has created a low-cost engine test stand for small thrust engines which may eliminate or reduce the problem. Primarily designed to test gaseous and liquid fueled engines, this stand incorporates an approach that reduces the time and associated costs involved with testing different engines and propellants on the same test stand.

### ***HOT Points***

- **Quick Disconnect Technology**
- **Utilizes a Mating Interface framework**
- **Reduces "Down" time**
- **Lowers re-configuration costs**
- **Scalable for large engine testing**
- **Increased efficiency**

## WHAT IS THE TECHNOLOGY?

The heart of this system is the Quick Disconnect (QD) technology; this technology is incorporated in the propellant lines used to transfer fuel and oxidizer from the test facility to the engine. Utilization of the QD technology allows testing on numerous articles without having to re-configure the test facility.

Another key element of the test stand is the mating framework; this framework consists of a removable cart on which the test article is mounted to a fixed interface on the test stand. The removable cart consists of an engine mounting assembly, an umbilical plate on which the QDs are mounted, and a caster system that is used in the positioning of the entire engine and cart assembly. Use of the removable cart for mounting the test article allows testing of one article while a second test article is being prepared for testing. The fixed interface consists of an alignment guide, an umbilical plate with hardware configurations matching that of the removable interface and propellant system connections. A latching mechanism has also been incorporated into both interfaces. This mechanism ensures connections that cannot be accidentally separated.

## WHY THE TECHNOLOGY IS IMPORTANT

Investment in newer, better technology to reduce both development and operational costs has been addressed in the development of the "Low Cost Engine Test Stand." Utilization of the Quick Disconnect (QD) technology and the Mating Interface technology developed by AJT provides an alternative, scalable for large engine testing, which will potentially reduce costs and increase efficiency in testing of rocket and jet engines. According to Bill St. Cyr, engineer at Stennis Space Center, expenses associated with reconfiguration of the test stand will be eliminated or at least greatly reduced.

Based upon estimated costs associated with retrofitting and reconfiguration, it is estimated the potential market for this technology is \$10,000,000. Entities requiring these systems include the U.S. government at Stennis Space Center in Mississippi and the Marshall Space Flight Center in Alabama, as well as, the commercial operations of Pratt & Whitney-Rocketdyne in West Palm Beach, and Lockheed Martin.

## SUCCESES

To date the AJT test stand has been used at John C. Stennis Space Center for testing a small methane fueled engine. Methane has been identified by NASA as a probable fuel for the Crew Exploration Vehicle (CEV) Reaction Control System and the Main Engine Propulsion System.

According to Randy Holland, Propulsion Test Directorate (PTD) Project Manager at the time, the testbed afforded SSC personnel the opportunity to develop test experience with methane and served as an applications platform for developing plume diagnostics, capabilities and Integrated System Health Management (ISHM) technologies.

## COMMERCIALIZATION

"The project market is \$10,000,000 based upon the estimated cost of retrofitting existing test stands at roughly \$500,000 per article. It is anticipated that the technology will provide a savings to the end user to increase demand throughout the industry," said Harlan Hyde, Vice President of Manufacturing Projects for AJT & Associates. At this time Quick Disconnect technology is being utilized on a limited basis; only Government owned facilities at Stennis Space Center and the Marshall Space Flight Center have application for the technology. Target markets for this technology include:

- Current commercial operations by the well-capitalized businesses with a heritage in space operations.
- The U.S. Government which has a strong interest in reducing costs associated with R&D efforts in this area.
- Private sector entrepreneurs developing their own technologies for space launch activities.
- Jet engine manufacturers, aircraft maintenance companies and major airlines.

## WHY SBIR

SBIR is a highly competitive multi-phase program that provides small U.S. businesses with federal funds reserved for conducting serious research and development. Phase I is the start-up segment with awards up to \$70,000, if chosen, Phase II awardees are granted up to \$600,000 to conduct research and development activities.

### Points of Contact

•Innovative Partnership Program  
Stennis Space Center, MS

PH-(228) 688-1929

Web - [www.technology.ssc.nasa.gov](http://www.technology.ssc.nasa.gov)

E-Mail - [technology@ssc.nasa.gov](mailto:technology@ssc.nasa.gov)

•AJT & Associates  
Cape Canaveral, FL

PH-(321) 783-9891

Web-[www.ajt.com](http://www.ajt.com)